

The Outdoor Treatment of Surgical Tuberculosis 5.

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THE OUTDOOR TREATMENT OF SURGICAL TUBERCULOSIS.

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THE value of outdoor treatment in surgical tuberculosis is no longer a matter of question and a literature is gradually accumulating dealing with the subject which is all one kind, extolling its virtues and speaking warmly of its efficiency; but such literature on the whole lacks definiteness and consists largely of general impressions or the recital of individual cases,^{3, 6, 7, 8, 9, 10, 11.} It is hoped in the present paper to present more or less definite records of a group of children from five to seventeen years old studied at the Massachusetts Hospital School for crippled and deformed children at Canton, because in this group of cases the opportunities for the continuous observation of the effects of outdoor treatment extending over a period of years with the same children have been excellent and unusual.

The object of presenting the paper in this form is, that in the opinion of the writers the case for the open air treatment of joint tuberculosis has not been strongly enough stated. And, moreover, that in addition to its efficacy in surgical tuberculosis, it has a wider bearing in

relation to institutions in which children, whether sick or well, are kept in large numbers. So that what may be formulated with regard to the effect of outdoor air on children with surgical tuberculosis may be applied to the distinctly larger field of its effects on children in general and probably on adults as well. The data here presented justify, however, conclusions only with regard to children.

The origin of the outdoor treatment of surgical tuberculosis apparently is to be credited to a small French watering place, Berck-sur-Mer,^{4, 5} where in 1852, during an epidemic of cholera, a peasant woman, Marianne Brillard, lost her husband and four children. After this she was known as "Marianne toute seule." To the care of this woman were confided some children with rickets and from her they received most painstaking attention. The result in these cases was such that it attracted the attention of Dr. Perrochaud, who sent her as assistants three sisters of the Franciscan Order of Calais. The work gradually extended, the home became largely occupied with tuberculous children. By gradual evolution, hospitals for the purpose of furnishing outdoor care for surgical tuberculosis were constructed at Berck, the first in 1861, followed by the great hospital in 1869, and then by a series of others. Marianne died in 1874, and twenty years after, a public homage to her memory was offered and she was given the name of the Founder of Berck. At present the hospitals and sanatoria at Berck accommodate between five and six thousand. It is a city of surgical tuberculosis. The municipality of Paris maintains a great hospital there for its children with surgical tuberculosis with some twelve hundred beds, besides which there

are numerous other institutions all of them devoted almost wholly to the care of patients with the same disease in the outdoor air.

In America the first movement on a large scale for keeping sick children out of doors, winter and summer, of which we are aware, originated at the Convalescent Home of the Children's Hospital at Wellesley, which was originally opened in 1879 but at first closed during the winter. The Convalescent Home, however, burned to the ground in 1904 and the only available place in which to carry on the work while a new building was being constructed was a small wooden frame house quite unfit to accommodate the required number of children. Additional buildings, therefore, were constructed in the form of roughly built wooden sheds spoken of as shacks. They were forty by twenty feet, with eight feet studding to the first pitch in the roof which was approximately nine feet. Rising from this perpendicularly was two feet studding, which supplied a row of windows on either side, another four feet pitch of the ridge pole finishing the roof. The sides of the building were fitted with sliding doors, which made it possible to open twenty feet of either side at a time. Windows were placed in these doors and at the ends of the building. A ten by six feet room furnished with a glass door was partitioned off at one end to enable the nurses and attendants to be more comfortable during the nights.

Here in December 1904, following the suggestion of Dr. H. L. Burrell¹, contained in a paper on surgical tuberculosis, some of the children, were given the open air treatment in place of what might be termed the country air treatment. That is to say, instead of living in a

country house, some of the children were kept night and day, winter and summer, in the open shacks described. Each building had a capacity for twenty cots and the temperature was regulated to 20° Fahrenheit by two ordinary coal stoves. The children at night were supplied with sleeping bags and flannel nightgowns, with caps attached and draw strings at the bottom.

The winter that followed this departure, that of 1904-1905, was one of the severest of New England winters. The first night the temperature dropped to 5° below zero; but no harm resulted and the outcome of the shack treatment was so satisfactory that when the new Convalescent Home was built, the dormitories were made wooden sheds similar to the pattern described with monitor roofs.

It is interesting to note that the provision bill at the Convalescent Home increased thirty per cent. after this treatment was instituted and the results in certain cases have been reported by Drs. Bradford¹² and Adams¹³ showing great improvement in individual cases and a gain in weight and hemoglobin in a group of cases observed.

Many hundreds of children in the eight years since these shacks were opened have received this treatment; but an inquiry as to the number of cases of illness that could be attributed to exposure in that time showed that there were but three cases of pneumonia, and that these three occurred in the early years in children who had been operated upon for empyema. There have been no frost bites or other complications to be attributed to exposure and the results have been so gratifying that the surgeons of the Children's Hospital regard the Convalescent Home with its facilities for outdoor treatment

as one of the most important factors at their command in the treatment of tuberculous joint disease.

The most modern exposition of this mode of treatment is in a hospital for surgical disease in children recently constructed at Heswall near Liverpool in England on the banks of the Dee, where the hospital is built without a front wall, the wards for the children containing only three walls, a ceiling and a floor. There are no curtains and only a few enclosed rooms.

We have all learned that it is not advisable to put children out of doors directly after operations and that it is unwise to expose to cold temperatures children under three years of age.

At present there are convalescent homes with provisions for out-of-door treatment, mostly at the seashore but often in the country, connected with many of the children's hospitals throughout this country and in Europe. There is as yet no evidence to prove that sea air is definitely more beneficial than country air.

Before proceeding to the consideration of the results obtained at the Massachusetts Hospital School at Canton, it may perhaps be best to define the class of children studied and the conditions under which they live. The institution is maintained by the State as a school and hospital for the education and care of cripples, Massachusetts being one of four states now providing for the proper education and care of this class of the unfit.

The Massachusetts legislature of 1904 appropriated a sum not exceeding \$300,000 for the purchase of land and the construction of buildings to accommodate three hundred crippled and deformed children and the necessary officers and employees, and the institution was formally

opened Dec. 1, 1907. Four children were at first admitted in January 1908 and the institution has by gradual evolution reached a stage in which it now houses 239 children. The class of children may be judged from the fact that in the first year, of 104 children admitted, the average age was nine years, yet 35½% were absolutely unable to read or write the simplest sentence. Of the 408 children admitted to the school from Dec. 1, 1907 to Dec. 1, 1912, 163 were cases of surgical tuberculosis of the bones or the joints, 84 were cases of infantile paralysis, 34 of rickets and the remaining 127 were cases of congenital deformities, various forms of paralysis and similar crippling deformities. The patients are admitted from all parts of the State upon the application of parent or guardian and a medical certificate that they are mentally competent but physically unable to attend the public schools. Many of them reach the institution so badly disabled that they cannot walk; some have never received previous surgical care; while others have unfortunately received improper treatment; some have discontinued treatment for one reason or another while others have been admitted by transfer from institutions in which they have made unsatisfactory progress or because conditions were such that they could not be properly cared for at home. The majority of the pupils are able to attend school on an average of one and one half hours daily and in addition to the school instruction, they receive industrial training in needle work, domestic science, gardening, shoemaking, carpentry, etc.

The institution was established in Canton, Massachusetts, on a hill with sixty-five acres of rolling land on the north shore of Reservoir

Pond about fourteen miles from Boston, at an elevation of 200 feet above sea level. About one hundred and fifty-two children live in two large dormitories. The architecture is similar to that of the shacks described at the Convalescent Home of the Children's Hospital, being of the monitor top construction and provided along the sides of the roof with windows which open



One of the four dormitory wards, showing arrangements of windows for direct ventilation.

wide. These dormitories are practically outdoor pavilions, excepting that they are closed and heated for a short time during the evening when the children are put to bed and in the morning when they are being dressed for the day. By careful regulation of the monitor windows and the direct supply of steam heat, it is possible to prevent the temperature in the wards from falling below 34° Fahrenheit without at any time keeping all sections of the monitors

completely closed. From October 15, 1911 to April 15, 1912, the maximum outside temperature was 62° Fahrenheit and the minimum temperature 2° below zero, the average being 31°.

In addition to these dormitories, there is a domestic science cottage in which sixteen of the children live. This is an ordinary wooden cottage, with the average amount of ventilation;



Section of infirmary ward, showing evenly sloped ceilings.

but with no special provisions for outdoor air such as exists in the large dormitories. Some of the boys live in the industrial building, which possesses no special facilities for direct ventilation and some of the adults connected with the administration, live in the brick administration building also without direct ventilation. There are two large play rooms connected with each dormitory and except in the roughest weather large sliding doors are open, so that except at meal time, when the children assemble in an

ordinary dining-room, they are living practically out of doors. There are no enclosed corridors and in passing to and from the dining-room all the children must go out of doors in all weather.

Of the eight grades of the school, five are conducted out of doors, provisions being made for outside and inside rooms, the inside rooms



Out-door school in February.

being used in severe weather, the outside rooms being covered by an awning which is the only protection afforded. The chief difficulty in the outdoor school problem has been to find teachers who were willing to undertake to teach out of doors through the winter. The children have suffered no inconvenience. The weight of each child is taken every week, hemoglobin tests are now made regularly, the height is recorded at intervals, and a daily record is made of every child in the institution. Surgical records are

also made on every child at entrance and at subsequent examinations.

Having thus defined the conditions under which these children live and the kind of children they are, it becomes of interest to consider several aspects of the life in this institution. These matters will be analyzed under the following headings:

1. Gain or loss in weight.
2. Gain in height.
3. Gain or loss in hemoglobin.
4. Effect on the prevalence and spread of contagious disease.
5. Effect on the prevalence of colds and sore throats.
6. Effect on auto-inoculation as shown by temperature.

In these respects definite results can be tabulated, and following this it may perhaps be permissible to say very briefly something of the general aspect of the cases from a surgical point of view; but in the subject under discussion general impressions without actual figures are of little value because there already exists a literature of general impressions from reliable observers and our only hope of adding to the subject lies in a chance of contributing definite data on certain points.

1. GAIN OR LOSS IN WEIGHT.

The children of the Hospital School are weighed at regular weekly intervals and any loss in weight is reported so that school attendance, recreation hours, diet, rest periods, etc. may be regulated accordingly. There appears to be quite a variation in the weight of children as recorded by different observers and Bowditch's average¹⁵ on the growth of Boston

school boys and girls, irrespective of nationality, have been taken for comparison because the majority of the Hospital School children are from greater Boston. Of the present 239 cases 99 or all those suffering from tuberculous affections of the bones or joints have been taken for consideration. 77.77% of these cases were under weight when admitted. The same children after an average residence of approximately thirty months showed an average gain of 13.84 pounds, while Bowditch's average gain for the same time for children of the same ages showed a gain of but 11.80 pounds. That is to say, the tuberculous children at Canton increased on an average of 2.04 pounds more than the standard estimated for normal children. As Bowditch's table includes only children from five to fourteen years no comparisons were made for seventeen of the Canton children who were over fourteen years. Had the older children been considered, the percentage of increase would have undoubtedly been greater because the older children have a longer record of out-door treatment. One of the striking features observed in the weight tabulation is that 46.46% of the children whose increase in weight exceeded that recorded for normal children were cases of hip joint disease. As might be expected the gain in weight is greatest during the first few weeks, the charts also showing a gradually progressive increase in the vast majority of cases.

2. GAIN IN HEIGHT.

The height records which were also compared with Bowditch's tables upon the same children as those whose weights were analyzed show, as might be expected, that the gain in height was not proportionate to the increase in weight.

Sixty-six or 66.66% were at all times under the average height. Twenty-one children (21.21%) at the average age of 6.38 years showed an admission height slightly above the normal, an increase which they were not able to maintain, however, for after an average residence of 2.95 years the ratio fell from 21.21% to 5.05%. Six per cent. of these cases were suffering from Pott's disease in whom the normal increase could not be expected, while those who were able to maintain the average normal growth were cases of tuberculous disease of the hip joint. Of the children who were under the normal average height when admitted, who increased to exceed slightly the normal (or 12.12%) were also cases of hip joint disease.

The above facts are chiefly significant as showing that children with hip joint disease are, under favorable conditions, able to maintain a fair average increase in height as well as in weight.

3. GAIN OR LOSS IN HEMOGLOBIN.

The great discrepancy in the hemoglobin figures given by various authorities renders it impossible to make any satisfactory comparisons. For instance Rotch¹⁶ states the adult standard is reached at the end of the sixth year while Holt¹⁷ observes that after the fifth year it gradually increases up to puberty. The wide variation not only between different individuals but also in the same individual referred to by Rotch is found in the Canton tests where the lowest was 50% and the highest 80% on admission with an increase to a minimum of 75% and a maximum of 95% by the Tallquist scale which was regarded as accurate enough for practical purposes. The fact that a gain was

made of 1.4% to an average of 81.73% may be worthy of mention.

4. EFFECT ON THE PREVALENCE AND SPREAD OF INFECTIOUS DISEASE.

In the five years from December 1, 1907 to December 1, 1912, the daily average of all patients in the institution was 154.85. During this entire five-year period, the only reportable contagious diseases which have occurred were nine cases of whooping cough, ten of scarlet fever, five of diphtheria, and twenty-two of chicken-pox.

Whooping cough occurred as follows: Four cases in September 1908, one in May, three in July, and one in August 1911. Because of the impossibility of an early positive diagnosis in whooping cough and the fact that the children were in close contact with each other daily in a congregate dining room, at school, and at entertainments, there is little doubt but that all were exposed to the infection, and the records of the institution showed that a comparatively small number had previously had the disease. The cases which occurred were contracted from children who were suffering from the disease when admitted. On account of the known highly transmissible character of whooping cough, it is evident that the tendency to spread in this institution was small.

Scarlet fever. There were ten mild cases in 1910, extending over a period of seven months, which were probably contracted from different sources. In May one boy developed scarlet fever six days after receiving a visit from his parents, who came from a locality in which there was a case of scarlet fever directly across the street.

Thirty-three days afterward another boy developed the disease, nine days after admission from a home in which scarlet fever had recently been epidemic. Both cases were quarantined in detached cottages. In fifty-three days from the appearance of the second case, a girl showed symptoms of the disease three days after receiving a visit from her mother and her case was followed by two others, who received visitors on the same date, all sitting together on the same settee. This sequence in the occurrence of cases suggests that they were contracted from independent sources. One girl developed scarlet fever in May, 1911; but no other children contracted the disease.

Diphtheria. There have been five cases in five years and no immunizing doses of antitoxin have been given at entrance. Three cases of diphtheria occurred in 1908, one in 1911, and one in 1913. Two of the 1908 cases had the disease when admitted. The 1911 case developed the disease soon after admission and was a doubtful case.

Chicken-pox. This constitutes the largest epidemic. In March 1911 nine patients and one employee came down with the disease almost simultaneously and were followed by twelve others in April, including two employees and the three children of the superintendent, so that strict quarantine was practically impossible.

In regard to the exposure of these children to sources of infection, it has been the policy of the institution to allow all children physically able and having proper homes, to make one or more visits home during the year and on an average one hundred persons came to visit the children weekly. During the last year more than four

thousand visitors were registered and 175 visits were made by the children during the same period. These conditions, of course, have greatly increased the opportunity for the introduction of contagious and infectious disease.

5. EFFECT ON THE PREVALENCE OF COLDS AND SORE THROATS.

One of the most notable evidences of the value of fresh air by day as well as by night, which the outdoor life in the ceiling ventilated wards affords, has been the freedom from common catarrhal head colds, so prevalent in this climate and especially in the congested tenement house districts, from which the majority of the patients come. By far the greater number of colds for the past five years have occurred during the past winter, which has been an exceptionally mild one, during which the population of the institution has averaged about three hundred, including employees.

Thirty-six individuals have had colds during the past six months and as nearly as it is possible to determine, they have been contracted outside of the institution by employees, who are frequently absent for recreation in crowded theaters and places of amusement and by children who have been absent on visits. The most significant fact is shown by the analysis of colds in the individual buildings, contrasting those which appeared in persons who live practically out of doors with those occurring in the ones who occupied buildings without direct ventilation.

At the infirmary, which is constructed on the monitor roof principle, with constant outdoor air, and with the majority of the children kept

on open verandas during the day, there has been an average of from fifteen to twenty-five patients and no colds have been observed during the winter either among the patients or employees. Four infirmiry nurses were under treatment for simple sore throat, but without coryza or other symptoms of cold. In the east dormitory, with a monitor roof, no colds were reported during the past winter but nineteen children and five employees were reported as having simple sore throats. This dormitory accommodates an average of seventy children and six employees. In the west ward, also a monitor top building, with an average population of eighty-two small children and six employees, twelve colds were reported and eleven cases of sore throat, four in employees.

Coming now to the buildings without direct ventilation, the industrial building is an ordinary wooden structure without special facilities for ventilation. The population of this building was an average of thirty-five, consisting of the strongest, most active and robust older boys. Here occurred during the past winter thirteen simple sore throats and nine colds. At the domestic science cottage, another well constructed, airy building but not provided with special facilities for ventilation where sixteen of the older girls of the more robust type live, every individual suffered from colds and sore throat, all of more protracted character than has elsewhere been observed except at the administration building, also without special facilities for ventilation, in which officers, domestics, and other employees are quartered to the number of thirty-five.

These figures are almost conclusive proof of the value of the monitor ceiling ventilated

wards, in diminishing the number of colds, as in each of these buildings an insignificant number of colds occurred, while in the indirectly ventilated buildings, with more convenient and generally approved methods of living, the record has been distinctly different.

But such a group of figures relating to colds, sore throats, and infections is significant chiefly by comparison with those relating to healthy children for the same period and fortunately by the courtesy of the attending physician of a large residential school for boys near Boston, it has been possible to obtain corresponding figures with regard to 220 healthy school boys from seven to sixteen years old for the same period from September to June, 1912, inclusive. These boys, coming from all over the country and belonging to the well-to-do class in the community, live in modern school buildings, in a delightful country town. They indulge freely in all out-of-door sports and are much more in the open air than the average boy. If one were to select a community in which boys lived under what would seem to be the best conditions for health, as to good food, regularity of life, reasonable discipline, close and intelligent medical supervision etc., one would be likely to select this school as embodying these conditions and the general reputation of the school for good health is excellent. Other schools would perhaps show more cases than here recorded, city schools undoubtedly would.

In order to present this important matter graphically it is necessary to resort to tabular form to bring out the point that out-door air apparently diminishes the liability to colds, sore throat, and respiratory affections and the comparison will be made only between those chil-

dren at Canton who live under outdoor conditions. Those who live in closed buildings are not included as vitiating the figures nor are employees included for the same reason.

BOYS' SCHOOL.

Population.	Affections. Respiratory	Coryza.	Sore Throats.
220	Bronchitis 23	98 (44.5%)	Pharyngitis
	Catarrhal 7		Tonsillitis
	Pneumonia		113 (51%)
	Croupous Pneumonia 4		
<hr/>			
220	34 (15%)	98 (44.5%)	113 (51%)
Total 220 boys.		245 illnesses (111.36%)	

CANTON.

	Average Population.	Respiratory Affections.	Colds.	Sore Throats.
Infirmery	20	0	0 (0%)	0 (0%)
East Ward	70	0	0 (0%)	19 (23%)
West Ward	82	0	12 (14.6%)	7 (8.5%)
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	172	0	12 (14.6%)	26 (22%)
Total 172 children.		38 illnesses (22%)		

That is to say, of 172 children living out of doors at Canton 22% suffered from coughs, colds, or respiratory troubles in a given period, while in the Boys' School in the same period 111.36% suffered from similar affections.

EFFECT OF AUTO-INOCULATION AS SHOWN BY TEMPERATURE.

The effect of the outdoor treatment has also been most agreeably noticed in the reduction in

temperature of the 99 tuberculous children at Canton as compared to some observations made by one of the writers upon out-patient cases of surgical tuberculosis of the spine and hip in the out-patient department of the Children's Hospital in 1890.¹⁵ The temperatures of these children were taken at the out-patient department, where they were all under ambulatory treatment. The cases at Canton have been correlated and cross indexed with great care, as were also the cases which were tabulated at the Children's Hospital 23 years ago, so that analogous cases are accessible to systematic investigation. At Canton, however, there is a larger proportion of convalescent or quiescent cases than was the case in the Children's Hospital group. Nevertheless, there were in the Canton cases 70 patients in whom the disease was acute, and who were under treatment by apparatus. In the 250 observations made at the Children's Hospital the evening temperature was found to be in general from one to three degrees above the normal, there being but 6 patients in the 250 whose temperature was below 99°. Of the 99 cases at the Hospital School at Canton, but two cases in the entire group were found to have an evening temperature above 100°, the variation in all others being but a fraction of a degree above or below normal. Nineteen were below 98°, 68 were between 98° and 99°, and 10 between 99° and 100°. Two cases showed a temperature of 100° or more. In one of these an alveolar abscess was present, which probably accounted for the temperature. The other was a case of advanced amyloid degeneration with discharging sinuses. Discharging sinuses were present in 15 of the Canton cases, and all of these showed a normal evening temperature,

with the exception of the case of amyloid degeneration spoken of above. In the Children's Hospital group of cases those with sinuses showed a uniformly high temperature.

A high temperature in tuberculous joint disease is generally accepted as evidence of activity and absorption, and that children in what may be considered the acute stage of the disease, pursuing the active life that is lived at Canton, show a normal temperature, is strong evidence of the fact that the process of auto-inoculation is favorably affected by the outdoor life.

With regard to the general effect of outdoor life in the cases of surgical tuberculosis under consideration, it is difficult to present anything more definite than general impressions.

Taken as a whole, these children have good color and are well nourished, very few of them suggesting by their appearance that they are tuberculous. In appearance they are quite different from the average child with bone tuberculosis seen in the outdoor department of the Children's Hospital. To be sure in the latter children the proportion of cases in the acute stage is large, whereas at Canton the proportion in the convalescent stage is larger. Still comparing acute cases with each other, the above statement holds good.

Children who come to Canton with distinct signs of tuberculous auto-inoculation in the way of anemia, fever and poor general condition as a rule improve rapidly and lose these symptoms.

But the most striking feature from a surgical point lies in the apparently increased power of repair which the patient seems to possess, over the local process, that is to say, the lesions are less destructive than those seen in the outpatient department in the city in the same class

of cases. There is less induration, suppuration diminishes where it exists, abscesses rarely develop and acute symptoms do not often arise in cases under treatment. In short, the local process seems more amenable to treatment.

In conclusion, it can only be repeated that this paper represents an attempt to present definite figures as to the effect on children with surgical tuberculosis of living in the outdoor air. That the material presented shows that even in the winter climate of New England this is not attended with risk of exciting respiratory troubles, frost bites or pneumonia. That coughs, colds and sore throats are infrequent among the children living out of doors and much less frequent than among a group of healthy boys who do not live wholly out of doors. That infectious disease has not spread among the children as easily as would have been expected. That after admission weight increases faster than in normal children and that hemoglobin also increases. That symptoms of auto-inoculation, as shown by increased temperature, are as a rule absent and that, in the opinion of the writers, the power of resistance and repair improves under these conditions.

It is hoped later to present a detailed study of certain cases of bone tuberculosis from these patients, but such a study cannot be entered on in the present paper.

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